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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/687,761	10/20/2003	Zarook M. Shareefdeen	3251378.0004	9587

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FASKEN MARTINEAU DUMOULIN LLP
Toronto Dominion Bank Tower
P.O. Box 20
Toronto-Dominion Centre
Toronto, ON M5K 1N6
CANADA

EXAMINER	
BOWERS, NATHAN ANDREW	

ART UNIT	PAPER NUMBER
1744	

MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/687,761	SHAREEFDEEN ET AL.	
	Examiner	Art Unit	
	Nathan A. Bowers	1744	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 March 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *20,21 and 26-81* is/are pending in the application.

4a) Of the above claim(s) *26-47* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *20, 21 and 48-81* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

1) Claims 20, 21, 48-54, 57, 58, 61-63, 65-69, 72-74 and 76-81 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ferranti (US 6358729) in view of the English translation of Fattinger (EP 0497214), Maddux (US 20020170858) and Fox (US 4366131).

With respect to claims 20 and 21, Ferranti discloses a biofilter system comprising a housing, an inlet for receiving contaminated air, and an outlet for exhausting cleaned air. A biofilter media (Figure 1:34) is situated between the inlet and outlet, and works to remove contaminants from the air stream. The biofilter system is further provided with a water delivery system. This is disclosed in column 3, line 42 to column 5, line 2. In column 4, lines 20-29, Ferranti indicates that the disclosed biofilter is equivalent to the biofilter disclosed by Fattinger. Fattinger teaches on page 2 that the filter includes grains that each comprise a porous hydrophilic nucleus surrounded by a hydrophobic coating. The hydrophobic coating comprises nutrients, organic carbon, an alkaline buffer, a bonding agent, an adsorptive agent and a hydrophobic agent. Page 2 teaches that an activated carbon and an adsorptive resin are applied as the means for coating the surface of the nucleus, and that microorganisms are deposited upon the surface of the nucleus. Page 3 teaches the use of a bonding agent, as well as an alkaline buffer system utilizing carbonates. Fattinger discloses that it is advantageous to provide the grains with material that is suitable as a nutritive substratum for the microorganisms. Fattinger also indicates that the coating includes compost, peat, and a layer of activated carbon. Although Fattinger states that microorganisms are found in the pores of the hydrophilic grains rather than as part of the hydrophobic coating, it would have been apparent to one of ordinary skill in the art to incorporate the microorganisms into the hydrophobic coating if so desired. Coating biofilter particulate supports with microorganisms is well known in the art, as evidenced by Kallenbach

(US 6936446), DeFilippi (US 6395522) and Chang (US 5981272). Fattinger, however, does not expressly disclose that the hydrophobic coating includes a metallic agent.

Maddux discloses a biofiltration system comprising a plurality of bio-media balls (Figure 4:80) that are packed into a housing. Water is passed through the housing and over the bio-media balls in order to remove contaminants, and bacteria are immobilized upon the bio-media balls in order to facilitate the degradation of contaminants. This is disclosed in paragraphs [0028]-[0033]. In paragraphs [0009], [0008] and [0041], Maddux discloses that the bio-media balls become coated with metal oxides during filtration because the iron in the contaminated stream is converted from a ferrous state to a ferric state by the bacteria. The ferric iron readily combines with carbonates and sulfur in the stream, and subsequently precipitates on the bio-media balls. See paragraph [0030]. Paragraph [0041] states that the bio-media balls are pre-coated with metal oxides before biofiltration.

Fox discloses a gas-phase filter system comprising a housing (Figure 1:10) for receiving contaminated air. The housing is adapted to accommodate a plurality of iron oxide particles (Figure 1:21) supported by a plurality of chemically inert solid particles (Figure 1:22). This is disclosed in column 3, lines 47-63. Column 4, lines 32-58 disclose that hydrogen sulfide contaminants in a gas stream react with the iron oxide particles, and are accordingly removed fro the gas stream.

Ferranti, Fattinger, Maddux and Fox are analogous art because they are from the same field of endeavor regarding filters for fluid treatment processes.

At the time of the invention, it would have been obvious to add a metallic agent to the hydrophobic coating disclosed by Fattinger in the system of Ferranti. Maddux teaches in

paragraph [0041] that it is possible to coat metal oxides onto filter media grains, and that the presence of metal oxides are capable of expediting the effectiveness of the biofiltration apparatus. Maddux teaches that sulfur contaminants are effectively removed from a waste stream when contacted by ferric iron derived from iron oxides coated on the surface of filter media particles. Although Maddux does pertain to sulfur removal in liquid waste streams, Fox provides evidence that iron oxide filter components are also effective in removing sulfur contaminants from a gas stream. In light of the Fox reference, there is no reason to believe that the metal oxide coated particles of Maddux would be incapable of removing sulfur contaminants from a gas.

With respect to claims 48 and 51-53, Ferranti, Fattinger, Maddux and Fox disclose the apparatus set forth in claims 20 and 21 as set forth in the 35 U.S.C. 103 rejection above. In addition, Ferranti discloses that the water delivery system includes irrigation conduits (Figure 1:38) to deliver water to the biofilter media. Nozzles (Figure 1:36) are operatively connected to the irrigation conduits for spraying water onto the biofilter media. This is described in column 4, lines 33-40. The housing includes a drain line in fluid communication with the biofilter media for removing excess water therefrom. Excess water is, according to Figure 1, returned back to a storage tank (Figure 1:40). In column 4, lines 41-47, Ferranti teaches that the rate of flow of water through the irrigation conduits is regulated by a control system. Accordingly, a flow meter for controlling the flow of water must inherently be provided.

With respect to claims 54, 57, 58 and 61, Ferranti, Fattinger, Maddux and Fox disclose the apparatus set forth in claim 20 as set forth in the 35 U.S.C. 103 rejection above. Ferranti additionally teaches the use of a pH monitoring probe for measuring the pH of the biofilter media. A control system is operatively connected to the water delivery system in order to actuate water delivery in response to input received from the probe. This is described in column 4, lines 41-47. Although Ferranti does not expressly state that the pH probe is positioned at the water outlet, Ferranti does teach that the probe monitors water moving from the filter bottom. It would have been apparent to place the probe at the water outlet in order to accomplish this.

With respect to claims 62 and 63, Ferranti, Fattinger, Maddux and Fox disclose the apparatus set forth in claim 20 as set forth in the 35 U.S.C. 103 rejection above. Ferranti further discloses a humidification chamber (US 1:20) disposed within the housing between the inlet and the biofilter media. The humidification chamber is equipped with spray devices (Figure 1:22) capable of delivering water to the polluted air. This is described in column 3, line 60 to column 4, line 7. Pneumatic spray and high-pressure water delivery systems are well known in the art.

With respect to claims 65 and 66, Ferranti, Fattinger, Maddux and Fox disclose the apparatus set forth in claim 20 as set forth in the 35 U.S.C. 103 rejection above. Additionally, Fattinger indicates on page 2 that the hydrophilic nucleus is made from a porous substance such as gas-aerated concrete, swelling clay, or pumice. All of these granular compounds are porous, low-density aggregates. Gas-aerated concrete in particular represents an aggregate that could intrinsically be produced by gas expansion at temperatures exceeding 1,100 degrees Celsius.

This is due to the fact that gas-aerated concrete is formed when gases expand within the aggregate, and thereby make the aggregate more porous.

With respect to claims 67-69, Ferranti, Fattinger, Maddux and Fox disclose the apparatus set forth in claim 20 as set forth in the 35 U.S.C. 103 rejection above. As previously described, Maddux discloses the use of biofilter particulate supports coated with iron oxide compounds.

With respect to claims 72 and 76, Ferranti, Fattinger, Maddux and Fox disclose the apparatus set forth in claim 20 as set forth in the 35 U.S.C. 103 rejection above. In addition, Fattinger teaches on page 2 that activated sludge from a wastewater treatment plant is added with the microorganisms to the biofilter media during inoculation. The activated sludge comprises microorganisms and acts as a nutrient source since microorganisms are known in the art to metabolize sludge.

With respect to claim 73, Ferranti, Fattinger, Maddux and Fox disclose the apparatus set forth in claim 72 as set forth in the 35 U.S.C. 103 rejection above. Ferranti additionally teaches in the table at the end of column 6 that it is known in the art to utilize *Thiobacillus* microorganisms in biofilters. More specifically, Maddux discloses that bacteria such as *Thiobacillus ferroxidants* are immobilized upon the bio-media balls in order to facilitate the degradation of contaminants. This is disclosed in paragraphs [0028]-[0033].

With respect to claim 74, Ferranti, Fattinger, Maddux and Fox disclose the apparatus set forth in claim 20 as set forth in the 35 U.S.C. 103 rejection above. Fattinger further indicates on page 3 that nutrients and organic carbon are provided by compost and peat.

With respect to claims 77 and 78, Ferranti, Fattinger, Maddux and Fox disclose the apparatus set forth in claim 76 as set forth in the 35 U.S.C. 103 rejection above. Maddux additionally states in paragraph [0045] that it is known in the art to culture bacteria in a laboratory setting before it is applied to the biofiltration medium. Agar and broth are known in the art as standard laboratory bacterial growth materials.

At the time of the invention, it would have been obvious to culture the bacteria disclosed by Fattinger and Ferranti in a standard laboratory growth medium such as agar or broth before moving the bacteria to the biofiltration apparatus. Agar and broth are known in the art to adequately provide for bacteria nutrient requirements. By culturing the bacteria in a laboratory setting, one would be able to grow the strains in a desired way, and ensure that the bacteria conditioned for a desired task. Agar and broth represent a viable and effective alternative growing medium to the wastewater system disclosed by Fattinger.

With respect to claim 79, Ferranti, Fattinger, Maddux and Fox disclose the apparatus set forth in claim 20 as set forth in the 35 U.S.C. 103 rejection above. In addition, Fattinger discloses the use of calcium and magnesium carbonates as alkaline buffers.

With respect to claims 17 and 18, Ferranti, Fattinger, Maddux and Fox disclose the apparatus set forth in claim 20 as set forth in the 35 U.S.C. 103 rejection above. Ferranti teaches in column 3, line 60 to column 4, line 19 and column 6, lines 19-30 that the pH of the humidification chamber, and thereby the biofilter medium, is maintained by water contained in tank 24. This water is kept at a pH of about 6. Furthermore, Fattinger states on page 2 that the grains have a size of approximately 2 to 8 mm.

2) Claims 49 and 64 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Ferranti (US 6358729) in view of the English translation of Fattinger (EP 0497214), Maddux (US 20020170858) and Fox (US 4366131) as applied to claims 21 and 62, and further in view of Thom (US 6479276) and/or Eder (US 5618730).

Ferranti, Fattinger, Maddux and Fox disclose the apparatus set forth in claims 21 and 62 as set forth in the 35 U.S.C. 103 rejections above, however do not expressly disclose that the water delivery system includes a steam generator for supplying steam to the biofilter media and/or the humidification chamber.

Thom and Eder disclose similar biofilter operations in which a waste gas is decontaminated through the metabolic action of microorganisms. Both Thom and Eder disclose the use of water delivery systems that are capable of supplying moisture to the biofilter. In column 4, lines 55-63, Thom indicates that it is known in the art to use steam as a replacement for water in some circumstances. Eder additionally discloses in column 7, lines 44-55 that it is beneficial to humidify waste gases using a steam injection device.

Ferranti, Fattinger, Maddux, Fox, Thom and Eder are analogous art because they are from the same field of endeavor regarding biofilter systems.

At the time of the invention, it would have been obvious to replace or supplement the water delivery system disclosed by Ferranti with a steam delivery system capable of introducing moisture to the biofilter media and the humidification chamber. Water and steam are considered to be functionally equivalent in their ability to add moisture to a desired area. The use of steam in biofilter applications is considered to be well known in the art, as evidenced by Thom and Eder. Absent a showing of criticality, it would have been apparent to replace the water system disclosed by Ferranti in favor of a steam system, especially if it was determined that steam was more effective in moisturizing the biofilter.

3) Claims 55, 56, 59 and 60 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Ferranti (US 6358729) in view of the English translation of Fattinger (EP 0497214), Maddux (US 20020170858) and Fox (US 4366131) as applied to claims 54 and 58, and further in view of Barshter (US 5861303).

Ferranti, Fattinger, Maddux and Fox disclose the apparatus set forth in claims 54 and 58 as set forth in the 35 U.S.C. 103 rejection above. Ferranti discloses the use of a control system operable to actuate water delivery in response to changes in pH, however does not expressly teach that temperature and pressure sensors are provided.

Barshter discloses a biofiltration apparatus designed to decontaminated waste gases. In column 6, lines 54-67, Barshter indicates that it is known in the art to include temperature sensors and pressure sensors capable of regulating biofilter operations.

Ferranti, Fattinger, Maddux, Fox and Barshter are analogous art because they are from the same field of endeavor regarding biofilters.

At the time of the invention, it would have been obvious to include temperature sensors and pressure sensors in the apparatus of Ferranti in order to allow the system to be responsive to a wider range of conditions within the biofilter system. Temperature sensors are considered to be well known in the art, and are beneficial because they can be used to ensure that an environment suitable to microorganism growth is maintained. Pressure sensors are advantageous because they can determine when the filter has become clogged or ruptured by monitoring changes in pressure drop across the filtration bed.

4) Claims 70, 71 and 75 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Ferranti (US 6358729) in view of the English translation of Fattinger (EP 0497214), Maddux (US 20020170858) and Fox (US 4366131) as applied to claim 20, and further in view of Saha (US 6291233).

With respect to claims 70 and 71, Ferranti, Fattinger, Maddux and Fox disclose the apparatus set forth in claim 20 as set forth in the 35 U.S.C. 103 rejection above. Fattinger indicates on pages 2 and 3 that activated carbon is incorporated into the granular biofiltration medium as a hydrophobic and adsorptive agent. Fattinger does not disclose, however, that the adsorptive agent further comprises clinoptilolite.

Saha discloses an air cleaning system that utilizes a biofilter (Figure 1:3) for removing pollutants. The biofilter is packed with sorbents and bio-solids which capture airborne contaminants and subsequently degrade them. This is disclosed in column 2, lines 15-52 and

column 4, lines 13-30. Table 1 indicates that clinoptilolite is utilized in the apparatus as a particularly useful adsorptive agent.

Ferranti, Fattinger, Maddux, Fox and Saha are analogous art because they are from the same field of endeavor regarding biofiltration systems.

At the time of the invention, it would have been obvious to utilize clinoptilolite in the biofilter medium disclosed by Fattinger and Ferranti as an adsorptive agent. In Table 1, Saha teaches that clinoptilolite is capable of adsorbing light volatile organic compounds and hydrocarbons, and removing ammonia and heavy metals present in fluid streams. Clinoptilolite aids in microbial growth and bio-oxidation, and is further useful because it increases bed porosity.

With respect to claim 12, Ferranti, Fattinger, Maddux and Fox disclose the apparatus as previously described, however do not expressly disclose that the nutrients used in the creation of the hydrophobic coating include phosphorus, nitrogen and potassium.

Saha discloses the apparatus as previously described. Saha further teaches that microorganisms immobilized within the biofilter are supplied with a steady stream of nutrients since the microorganisms are able to metabolize contaminants from wastewater and waste air. In column 2, lines 53-65 Saha indicates that the microorganisms are provided with nitrogen, phosphorus and potassium in this way.

At the time of the invention, it would have been obvious to ensure that the nutrients provided by the hydrophobic coating disclosed by Fattinger and Ferranti included phosphorus, nitrogen and potassium. In column 2, lines 53-65 Saha teaches that phosphorus, nitrogen and

potassium are useful nutrients that are necessary during bioxidation and metabolization processes that convert contaminants to carbon dioxide and water. Phosphorus, nitrogen and potassium are known in the art as elements necessary for microorganism growth.

Response to Arguments

Applicant's arguments filed 21 March 2007 with respect to the 35 U.S.C. 103 rejections involving the combination of Ferranti, Fattinger and Maddux have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground of rejection is made in view of the combination of Ferranti, Fattinger, Maddux and Fox.

It is agreed that Maddux only discloses the use of iron oxide coatings in the removal of sulfur contaminants from a liquid waste stream. Although Maddux does pertain to sulfur removal in liquid waste streams, Fox provides evidence that iron oxide filter components are also effective in removing sulfur contaminants from a gas stream. In light of the Fox reference, there is no reason to believe that the metal oxide coated particles of Maddux would be incapable of removing sulfur contaminants from a gas.

Conclusion

This is a non-final rejection.

No claims are allowed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nathan A. Bowers whose telephone number is (571) 272-8613. The examiner can normally be reached on Monday-Friday 8 AM to 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gladys Corcoran can be reached on (571) 272-1214. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

NAB

GLADYS JP CORCORAN
SUPERVISORY PATENT EXAMINER